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THE GRASS BALDS OF THE GREAT SMOKY
MOUNTAINS OF TENNESSEE AND
NORTH CAROLINA

BY

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THE GRASS BALDS OF THE GREAT SMOKY MOUNTAINS OF TENNESSEE AND NORTH CAROLINA.*

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Within the relatively small area comprising the Great Smoky Mountains of Tennessee and North Carolina may be found the richest flora, and surely, in its virgin condition, the most luxuriant deciduous forest on the whole North American continent. It is, with the rest of the great Unaka range, the natural dispersion center of the eastern deciduous forest, and contains such a relatively great number of endemic species that it stands unique as a vegetation center.

There are four major reasons for this unusual floristic development.

First.—The region is about four hundred miles north of the Gulf of Mexico and three hundred miles east of the Valley of the Mississippi, being thus assured of a fairly constant supply of moisture-laden winds.

Second.—The peaks are relatively high. There are seven in the eighteen miles between Clingmans Dome and Mt. Guyot that stand over 6,000 feet and in the whole Unaka range there are over forty of this type, with a considerable number of peaks having an altitude of more than 6,500 feet, many of them rising over a mile from their immediate bases. These altitudes are sufficient to keep the upper slopes almost constantly bathed in fog, a feature responsible for the name given these mountains. This type of relief has also given rise to deep, well protected valleys or "coves" with an abundant supply of moisture at the lower as well as the higher levels. The height to which the major peaks rise also brings about a constant floristic succession due to altitudinal effects.

Third.—The region was but little affected by the Pleistocene glaciation. The nearest continental ice was over two hundred miles away, with the Cumberland range a probable barrier to the incidental winds blowing from off the polar cap. In addition, the deep coves of the lower altitudes afforded ample protection during the occasional periods of lowered temperature.

Fourth.—The Appalachians, an almost unbroken chain, stretched for nearly a thousand miles in a north-easterly direction, tapping the reservoir of post-Cretaceous, circumpolar plant migrants.

*Papers from the Department of Botany, the Ohio State University, No. 273.

THE BALDS.

There are two types of "balds" which occur in the Great Smoky Mountains, the "heath bald" and the "grassy bald." Both types are essentially treeless, the heath bald being dominated by woody ericaceous species, while the grassy balds appear to be consistently herbaceous.

Cain ('30), who made a statistical analysis of the heath balds of the Mt. LeConte area, concluded that they were post-climax, developing on the windward side of the upper slopes and peaks above 4,000 feet after the disturbance of the original forest. He recognized several types, depending upon the altitude at which they develop and the contiguous forest associations from which they were derived, being best developed as sub-alpine types above 5,000 feet in the spruce-fir zone.

The grassy balds, in the area under consideration, develop on the rounded tops and slopes mainly between 4,500 and 5,700 feet, and are surrounded by a deciduous forest. It is to be noted that the heath bald typically develops in the northeastern part of the area mainly within the limits of the spruce-fir zone, while the grassy bald is best developed in the southwestern part where the spruce and fir are absent.

THE GRASSY BALDS.

It has long been the belief of those who have speculated on the origin of the grassy balds, that the early settlers of nearly a hundred years ago cleared or burned off the tops of these ridges in order to produce a grazing place for their stock. It is not the purpose of the present writer to cast any aspersions on the actions or purposes of the pioneers who settled in the broad fertile valleys such as Cade Cove, but it does not seem reasonable that those sturdy peoples, frugal as they were, would have taken the trouble to make such an extended system of pastures as has existed for at least a century.

The pastures would have been over 3,500 feet above their home sites and five or ten, or more, miles distant, necessitating either the removal of responsible members of the family from the fields below, or the hiring of special herders for the stock, the general plan at the present time. Roads had to be built*

*Making a new road to the "top" was a community event and was a matter of deep concern. Early in the last century a road was to be built from Cade Cove to the top in the general direction of Thunder Head. The argument waxed hot

and the water supply, at best not overly abundant on the balds, had to be watched. It seems to the writer, rather, that if these early settlers went to the trouble to burn and clear these distant mountain tops, they did it merely to *enlarge grassland areas already present* and not to create new ones.

It is true that grazing and fire have been the important factors in the changing physiognomy of the balds, but with this in mind, an examination of the region over a period of three years and at various seasons from the Little Tennessee River (1,500 ft.) to Parson Bald (4,700 ft.), and from Cade Cove (1,800 ft.) to Gregory Bald (4,957 ft.), and along the state line ridge to Little Bald (4,700 ft.), gave no hint that these factors have been the ones which gave rise to the typical grassy bald.†

FACTORS IN THE DEVELOPMENT OF THE GRASSY BALD.

In the northeastern portion of the Great Smoky Mountains abundant stands of spruce and fir occur at the higher altitudes. In ascending a typical mountain in this portion of the area, such as LeConte (6,593 ft.), one may observe that the rich lowland mixed forest (1,500 ft.) soon gives way to a dryer forest containing a greater percentage of oak and chestnut and finally pine. Within a few hundred feet the situation is reversed; the pines give way to the oak-chestnut type. At still higher elevations the maple, and beech moves out of the coves and onto the slopes. Above 4,500 feet the beech appears on the ridges where it mingles with the birch and finally above 5,000 feet with the spruce and fir, often occurring in pure stands, but dwarfed by the moist cool climate of the higher altitude. The spruce and fir occur on the higher slopes and peaks, in the region of almost perpetual fog.

There is no doubt about the constant water supply of the spruce-fir forest, for when the writer visited the area in September following the most unusually dry summer of 1930 there seemed to be no great dearth of soil moisture at the higher elevations in spite of almost complete lack of rain since June.

as to which of two ascending spurs should be chosen. A vote was then taken and it was a tie. One of the settlers who had not yet voted, a native of northern Europe, said: "I bote vor dis vun." In the "Cove" they still speak of "Bote Ridge" and "Defeat Ridge."

†The writer has not made a study of the most easterly balds, as Silers Bald; consequently any statements do not include that area.

During the summer season there is an almost continual patter on the forest floor made by condensed moisture dripping from the trees. In addition to the "drip rain" of the spruce-fir forest, these mountain tops usually have an annual precipitation perhaps in excess of 60 and sometimes estimated at over 80 inches.*

It is thus evident that there is a reversal in the forest types as one ascends in the northeastern part of the area, the lowland



FIGURE 1. GREGORY BALD.

The general aspect of the eastern margin of the bald. The grass in the foreground is mainly *Danthonia compressa*.

forests being mainly moist and warm, the middle forests dry and the upper again moist but cool.

The ascent of a mountain in the southwestern portion of the area typically gives the following gross succession. This particular one is taken on the main northeast facing ridge rising from Cade Cove to Gregory Bald.

The valley of Forge Creek (2,000 ft.) contains the usual rich, mixed deciduous forest with hemlock, white pine and rhododendron. Above this, the exposed slopes (somewhat modified by excessive cutting and fire) soon change to an oak-

*No data ^{are} available for the peaks of the Great Smoky Mountains, but comparable altitudes in the Blue Ridge have an annual precipitation of nearly 100 inches.

pine complex. At 3,000 feet the pines are very abundant, giving way to the chestnut-chestnut oak type at 3,500 feet. Above 3,500 feet the chestnut oak is slowly replaced by red oak.

Above 4,000 feet an occasional beech is seen, the dominant forest being red oak-chestnut-red maple-chestnut oak with an occasional magnolia (*M. fraseri*). At 4,500 feet the red oak-chestnut-red maple type is still dominant, but in the sag (about



FIGURE 2. GREGORY BALD.

Detail of the southern margin of the bald. The trees (red oak and chestnut) are 6-10 feet tall. The browsed shrubs are mainly *Vaccinium* and *Salix*. Figures 1 and 2 were taken in a driving fog.

4,750 ft.) just below the bald, beech is much more common, with a scattering of birch and buckeye. Within the next 50 feet the mesophytic species disappear leaving a practically pure stand of chestnut-red oak. As one ascends, this chestnut-red oak forest becomes more and more stunted until it is less than twenty feet high, suddenly giving way to a low, dome-shaped treeless area—Gregory Bald—at an elevation of 4,957 feet. (Fig. 1).

At first glance the bald seems to be an open grassland completely devoid of woody species, the low meadow vegetation stopping abruptly at the edge of the dwarf forest. A closer

examination reveals that in a few places shrubs six to eight feet high occur between the open grassy area and the forest. A still closer examination shows that the meadow is by no means a pure herbaceous association, but has a zone around the edge sometimes over fifty yards wide, which contains a high percentage of woody species so closely browsed that whole areas may stand less than six inches high. (Fig. 2.) These areas of browsed shrubs are by no means confined to the margin of the bald, but occur in scattered patches over the lower slopes, thinning out toward the top.

The determination of the species making up the woody flora of the bald has been exceedingly difficult owing to the closely browsed condition of the plants. Consequently the writer does not feel justified in presenting a floral list and in those plants noted freely admits the possibility of error.

In September, 1930, the larger shrubs of the bald were *Crataegus* (*C. macrosperma* and possibly *C. roanensis*) and *Azalea* (*A. lutea*). The smaller shrubs were represented by *Vaccinium* spp., (one type somewhat resembling *V. corymbosum*), *Salix* spp., (*S. tristis* often formed dense mats, while another form with sprouts about one foot high greatly resembled *S. discolor*. *S. humilis* may also have been present) and in addition, numerous clumps and individuals of *Xolisma ligustrina*. *Epigaea repens* also was fairly common.

The more open grassy areas contained an abundance of *Danthonia compressa* and *Juncus tenuis* with additional grasses, sedges, etc., and other herbaceous types, such as the pin-weed, *Lechea* (*L. racemulosa* or *L. leggettii*) and *Viola pedata*, including a goodly number of obviously adventive "weeds" of the lower pastures.

Because of the scantness of remains of the original covering and the evident disturbance of occasional fires and decided over-grazing, it is very difficult to reconstruct the original vegetation type of Gregory Bald as it was before the advent of the white man. In his general statement concerning the grassy balds, Cain ('31) concluded that they are natural phenomena for the "soil profiles show from a few inches to a foot or more of homogenous black soil of grassland type, which is too deep and mature to have developed since the advent of the white man, with the possibility of his having cleared off the trees."

While in general this statement is correct, the writer encountered a certain unevenness or "spotty" nature in the distribution of the black soil. In certain restricted areas this could be traced to excessive erosion initiated by the pawing of animals, particularly sheep. However, taken as a whole, this is not true for the bald and it is the opinion of the writer that the area was not originally a pure grassy meadow, but one with numerous "shrub islands" of various types. This view was substantiated by Mrs. John Oliver, long a resident of Cade Cove, who said that she "had it from the older folks long dead" that Gregory Bald was "originally a blueberry meadow" and had "always been a bald."

The present high percentage of willow in the shrub population is no doubt due to the ease with which willow regenerates in heavily grazed areas by vegetative means. It is also true that grazing, particularly by sheep, is decidedly injurious to certain Ericaceous species. With this in mind, it seems probable that Gregory Bald was once dominantly a heath bald, containing open spaces with a heavy covering of grasses, sedges and other herbaceous species. This type of bald is distinctly a dry one, having little in common with the heath bald developed at the higher altitudes in the moist spruce-fir zone, and is easily the driest bald type of the whole Great Smoky Mountain range.

In considering the factors underlying the production of the "grassy bald," the writer has already mentioned the fact that in the area where the grass balds develop there is a sudden appearance of a scrub forest near the top of the ridge, the last forest sometimes being a stunted chestnut-red oak type. The altitude and steepness of slope are not the determining factors, for comparable altitudes and steeper slopes some miles to the northeast support a thick stand of beech, birch, spruce and fir. The writer can give no plausible causative factor other than the following. These balds occur in the southwestern portion of the range and are more exposed to the dry and sometimes hot southwesterly winds that occasionally sweep in across the valley of the Little Tennessee River in mid-summer. The effect of these desiccating winds is easily noted by climbing from the river to Parson Bald or Gregory Bald, for as one ascends, the forest becomes more open and park-like with numerous small grassy areas often containing a considerable dry heath population. It is not meant to convey the impression that all the

southwesterly winds are dry and hot, for the grassy balds are often bathed in fog, but in mid-summer there are occasional periods of excessive drought, and it is this extreme that limits the character of the bald rather than the general climatic mean.

SUMMARY.

There are two major types of treeless areas or "balds" which occur in the Great Smoky Mountains of Tennessee and North Carolina, the "heath bald" and the "grassy bald."

The heath bald typically develops on the upper slopes and peaks, being best developed above 5,000 feet in the northeastern part of the range mainly within the area of the spruce-fir forest.

The grassy bald develops on the rounded tops and slopes between 4,500 and 5,700 feet in the southwestern part of the range and is surrounded by a deciduous forest.

A study of the area surrounding Gregory Bald led to the following conclusions:

1. The grassy balds were originally meadows containing numerous clumps of low shrubs, dominantly Ericaceous, with higher shrubs at the margin.

2. The balds were already present at the advent of the white man.

3. Any clearing that the early settlers did was not to produce grassland areas, but merely to enlarge those already present.

4. The grassy balds of the *southwestern portion* of this range are a natural phenomenon probably produced by occasional desiccating southwesterly winds, their grassland character being intensified during the last century by fires and decided over-grazing.

The writer wishes to acknowledge the assistance of Prof. J. H. Schaffner, of the Ohio State University, in the identification of certain plants, and the suggestions given by E. F. McCarthy, Director of the Central States Forest Experiment Station, who spent a number of years in this general region.

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